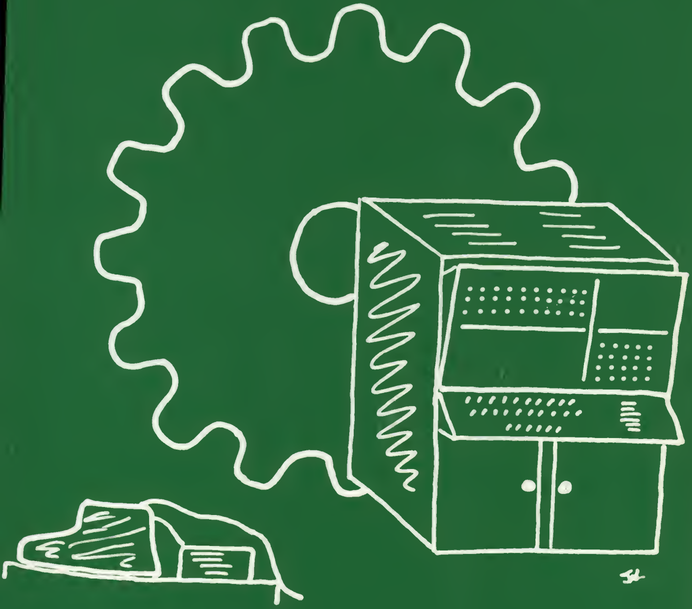
Mechelec̈iv

Volume 26 November – 1967 No. 2



THE GEORGE WASHINGTON UNIVERSITY

NOVEMBER 1967

Jobs that just might change the world

Move people through rush hours at 80 mph. Westinghouse built the experimental transit expressway in Pittsburgh. And we are building the computerized controls for the San Francisco mass-transit system that will be the model for others throughout America. We're looking for people to help us build equipment that will move people as they've never been moved before.

These graduates needed: Engineering, Physical Sciences, Social Sciences, Engineering Administration, Industrial Technology, Business & Liberal Arts.

Tap the atom with the company that started it all. Westinghouse supplies some of the largest nuclear generating plants in the world. We are building nuclear rocket engines. Our reactors power nuclear submarines. But this is only the start. We need people for some of the most fascinating projects we've ever attempted.

These graduates needed: Electrical Engineering, Mechanical Engineering, Industrial Engineering, Chemical Engineering, Engineering Mechanics, Marine Engineering, Structural Engineering, Ceramics, Nuclear Engineering, Materials Science, Physical Sciences.

Desalt the world's oceans

Westinghouse has 73 water-desalting units operating or on order around the world. Now we need people to help us design and build facilities that can desalt 150 million gallons a day—and solve some of the toughest water-supply problems we've ever tackled.

These graduates needed: Electrical Engineering, Chemical Engineering, Materials Science, Physical Sciences, Industrial Engineering, Engineering Mechanics, Mechanical Engineering, Civil Engineering.

Take a dive and explore the ocean 20,000 feet down. Westinghouse is developing a fleet of self-propelled undersea vehicles. In them we will dive deep, explore, salvage and probably discover more than any other single company in oceanography. We need adventurers to join the quest that has already taken us all over the world.

These graduates needed: Electrical Engineering, Mechanical Engineering, Chemical Engineering, Materials Science, Marine Engineering, Ocean Engineering & Science.

Build a city from scratch—the way a city should be built.

Westinghouse has just purchased an embryo city. We're looking for people to help us rebuild many of the existing cities in America. We can do it—Westinghouse now provides more products, systems and services for construction than any other single company.

These graduates needed: Engineering, Physical Sciences, Social Sciences, Engineering Administration, Industrial Technology, Business & Liberal Arts.

Fly to Mars

When the first expeditionary vehicle takes off, Westinghouse will be there.

We are building the nuclear engine for voyages into deep space—to Mars and Venus and beyond. The jobs are exotic. We need more people to help us now.

These graduates needed: Electrical Engineering, Mechanical Engineering, Chemical Engineering, Materials Science, Nuclear Engineering, Aerospace Engineering, Physical Sciences.

Want to change the world? Your best opportunity lies with a company like Westinghouse. Contact L. H. Noggle, Westinghouse Education Center, Pittsburgh, Pa. 15221—or see the Westinghouse interviewer on your campus.

An equal opportunity employer.

You can be sure if it's Westinghouse

Depends on the giant. Actually, some giants are just regular kinds of guys. Except bigger.

And that can be an advantage.

How? Well, take Ford Motor Company. We re a giant in an exciting and vital business. We tackle big problems. Needing big solutions. Better ideas. And that's where you come in. Because it all adds up to a real opportunity for young engineering graduates like yourself at Ford Motor Company.

Come to work for us and you'll be a member of a select College Graduate Program. As a member of this program, you won't be just another "trainee" playing around with "make work" assignments.

You'll handle important projects that you'll frequently follow from concept to production. Projects vital to Ford. And you'll bear a heavy degree of responsibility for their success.

You may handle as many as 3 different assignments in your first two years. Tackle diverse problems. Like figuring how high a lobe on a cam should be in order to yield a certain compression ratio. How to stop cab vibration in semi-trailer trucks. How to control exhaust emmission.

Soon you'll start thinking like a giant. You'll grow bigger because you've got more going for you.

A network of computers to put confusing facts and figures into perspective.

Complete testing facilities to prove out better ideas.

And at Ford Motor Company, your better ideas won't get axed because of a lack of funds. (A giant doesn't carry a midget's wallet, you know.)

Special programs. Diverse meaningful assignments. Full responsibility. The opportunity to follow through. The best facilities. The funds to do a job right. No wonder 87% of the engineers who start with Ford are here 10 years later.

If you're an engineer with better ideas, and you'd like to do your engineering with the top men in the field, see the man from Ford when he visits your campus. Or send your resume to Ford Motor Company, College Recruiting Department.

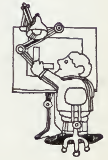
You and Ford can grow bigger together.

Ford

THE AMERICAN ROAD, DEARBORN, MICHIGAN
AN EQUAL OPPORTUNITY EMPLOYER.

What's it like to engineer for a giant?

Rather enlarging!



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COVER

Some of the objects significant to the development of the computer.

FRONTISPIECE

The first high resolution photograph of the moon's far side taken by Lunar Orbiter I. (See page 6.)

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LUNAR ORBITER MAPS THE MOON

Edited by

Spencer Hum

These are the first United States pictures of the moon taken by a spacecraft in orbit about the moon. They were taken by the Lunar Orbiter I on August 18th.

The mission of the Lunar Orbiter series was to photograph possible landing sites for future lunar flights and to photograph the hidden side of the moon. On August 10, 1966, Lunar Orbiter I was launched from Cape Kennedy, Florida. It achieved orbital status about the moon on August 14th.

The 850 pound satellite resembled a truncated cone. Four paddle-shaped solar panels extended from the base. A dish-like directional antenna transmitted data back to earth while a low-gain antenna received command signals.

Lunar Orbiter carried a medium resolution and a high resolution camera. Unlike the later Surveyor flights, the Lunar Orbiter used a true photographic process, with conventional silver halide material recording the initial image.

Two exposures from each camera were made simultaneously on 70mm Kodak Special High Definition Aerial Film. This filled a strip of film 11.7 inches long. The film was then automatically processed by placing it in contact with Kodak Bimat Transfer Film, a material pre-soaked with the processing chemicals.

The 2.4 inch wide frame of processed film was scanned with 18,942 horizontal scans, each 0.1 inch wide. The film was then advanced 0.1 inch and the next scan was made in the opposite direction. The total scanning time for a frame was about 40 minutes. In all, 194 exposures were made by each lense.

Fig. 2. This picture of the great lunar crater Copernicus was taken through the telephoto lens of the Kodak photo system. The Lunar Orbiter was 28.4 miles above the moon at the time. Known to astronomers as the "monarch of the moon," Copernicus is 60 miles wide and two miles deep.

The frontispiece was taken by the high resolution camera of Lunar Orbiter I and shows an area approximately 75 miles by 100 miles.

As of this writing, Lunar Orbiter I has been successfully followed by Lunar Orbiters II, III, IV, and V. More than 98% of the moon's surface has been photographed and mapped by these Lunar Orbiters.

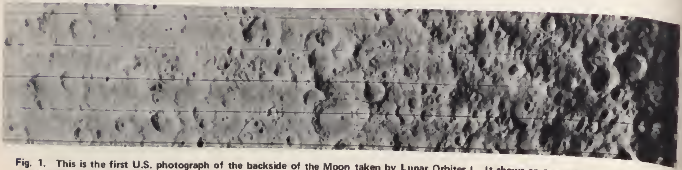


Fig. 1. This is the first U.S. photograph of the backside of the Moon taken by Lunar Orbiter I. It shows an area approximately 75 x 100 miles. North is approximately at the top of the photograph when viewed with the narrow strip of photographic test patterns on the right side. The test patterns are used to calibrate the photography.

FACULTY SPOTLIGHT

by Peter Austin

Dr. A. M. Kiper

Dr. Kiper was educated at the Technical University of Istanbul where he received his Masters in Mechanical Engineering in 1951. After working for a year, Dr. Kiper was granted a Fulbright Scholarship to study at Purdue University where he received his Ph.D. in Mechanical Engineering in 1956.

He returned to Turkey to teach at the Robert's College of Engineering in Istanbul. However, in 1963 he came back to the United States, spending one year teaching at the South Dakota School of Mines, three years at Drexel Institute of Technology, and arriving at George Washington in September, 1967.

Dr. Kiper's main fields of interest are Thermodynamics and Heat Transfer in which he is currently engaging in research. This semester he is offering courses in undergraduate Heat Transfer Theory (ApS 87) and Thermodynamics (ApS 85) and a graduated course in Heat Transfer Theory (Engr 293).

Dr. Kiper is also a member of American Society of Mechanical Engineers, American Society of Engineering Education, Sigma Chi, Pi Tau Sigma, and Tau Beta Pi.

Dr. Kiper is married, has two daughters, and enjoys the suburban atmosphere of Rockville, Maryland where he pursues the hobbies of music, reading, tennis, and swimming.

INDEX TO ADVERTISERS

Since the beginning of civilization, man has searched for mechanical counting, accounting and calculation aids. Imagine the delight of the first shepherd who, even though he could not count, managed to keep count of his sheep. He would add one stone to the pile for each animal which left the pens in the morning, and remove one stone from the pile for each sheep returning in the evening. If he had stones left in the pile after the sheep had been gathered, he knew he had to look for the missing animals. Probably if he had more sheep than stones he figured that this was the other shepherd's worry and not his.

Here was the first accumulator (the pile of rocks), and arithmetic unit (the shepherd adding or subtracting stones). Also note that at this early stage in computing machinery overflow and underflow problems plagued the hardware (too few or many sheep or stones). The system was truely digital operating in the radex one.

BIRTH OF THE COMPUTER

Next came the first model of the analog computer, the scales. The simple balance procedure, probably first used to measure the local ruler's weight in jewels and precious metals, is still in use today in modern analog systems. The scale has been replaced by the electrical bridge and the reference weights by precision resistors.

Several thousand years before Christ the next digital computer system was available in the abacus. The precise origin of this invention is not known. However, it is known that the early Egyptians, Greeks and Romans utilized this computation aid. Today expertise in the use of this device has enabled several far easterners to actually out-perform modern mechanical calculators.

In 1642 Blaise Pascal, a 19-year-old Frenchman, invented a computing device. This forerunner of modern calculating machines was composed of ten numbered wheels and an assortment of gears. Gottfried Wilhelm Leibnitz carried Pascal's work forward with his fabrication in 1671 of a calculating machine. Leibnitz's machine was exhibited before the leading scientific societies of the day, the Academy of Paris and the Royal Society of London. This instrument was capable of subtracting, multiplying, dividing and extracting roots.

An advanced calculating engine was devised by H. H. Muller of Germany in 1786. Production techniques, however, were not sufficiently advanced to allow this instrument to be built. A century and a half after Pascal died, Charles Babbage produced the first of his calculating engines, the "Difference Engine." This machine was capable of calculating a function of a variable for equally spaced values of the variable. Babbage was appalled with the gross inaccuracies of the mathematical and astronomical tables of the day and desired to utilize his device to recompute these basic tables. Babbage's first machine was only partially finished, because of the lack of relevant technology. This in itself was unfortunate, since Babbage himself was a proponent of the development of machine tools, mass production, and other technological advances, under which his machine could have been fabricated.

Babbage was truely a genius, ahead of his time, he performed the first "Operations Research" analysis on the pin making and publishing industries. In 1822 he completed literally thousands of detailed drawings for an "Analytical Engine" based on the very fundamentals used today by the computer industry. This instrument was far ahead of its time, and was never fabricated, because the means did not exist for transforming his dream into reality.

ELECTRICAL INNOVATIONS ENHANCE ADVANCEMENTS

Little advance has been made in the basic principles behind the mechanical calculators, from these early models. Today's modern electro-mechanical calculators work on substantially the same principles as their historical forebears. There are remarkable resemblances between these precisely machined and smoothly operating instruments and their wooden counterparts. As technology advanced, bigger and faster mechanical calculators have been devised with more invested interest in the "crome plating" . . . printing mechanisms, numeric readouts, etc. Desk calculators are even available today which allow remote units to time-share a master arithmetic unit.

About 1879 Lord William Thomson Kelvin designed mechanical linkages and methods suitable for analog integrating machines. Many of these ideas are in use in the modern servo systems and analog computers.

In 1885 Dr. Herman Hollerith rediscovered the punched card. Punched cards were first used in the early 1800's by Joseph Marie Jacquard who designed a weaving loom completely controlled by punched cards. Dr. Hollerith was primarily interested in tabulating and compiling statistics from the 1890 census, a feat which had required 7 years for the 1880 census. He chose punched cards for his data media. He utilized a card of 45 columns and punched round holes. Thus the 1890 census data saw the first processing on EAM (electric accounting machines). The company Hollerith formed produced railroad accounting machinery. In 1911 the company was known as Computing Tabulating Recording Company and by 1924 it had become International Business Machines.

This early entry in the modern computing field heralded the phenominal growth of the modern computer industry. Today the man whose life is not touched by automated accounting is rare indeed. If nothing else his income tax return is computer processed, as well as, probably his credit card accounts, bank account, college class registration, etc., etc.

The first large scale automated slide-rule was the "Differential Analyzer" an analog mechanical computer designed and built by Dr. Vannever Bush at the Massachusetts Institute of Technology in 1925. Dr. Bush like his predecessors discovered that long gear trains require power, a problem which he solved with torque amplifiers. The advent of elec-

CHIPS AND WATER

by John Wolfgang

John Wolfgang graduated from the George Washington University School of Engineering and Applied Science with a BSEE in 1962 and an MSE in 1967. He is presently working in the field of Space Flight data processing and control systems at Goddard Space Flight Center, National Aeronautics and Space Administration.

tronics solved many of these mechanical problems by allowing the same calculations to be performed completely in the electrical domain. These electrical systems are the backbone of modern analog computers.

Dr. George R. Stibitz and Samuel B. Williams built the first semiautomatic digital machine, and named it "Computer Complex", at Bell Telephone Laboratories in 1939. This was a hardwired fixed sequenced relay logic machine, with teletype input and output. Also this machine was controlled and utilized remotely over a teletype system, fore-shadowing present data transmission systems. The first fully automatic computer the MARK I was a joint effort between Harvard and IBM. Dr. Howard Aiken, then professor of Mathematics at Harvard conceived the basic machine design and IBM built it in 1944. The MARK I was a relay switch machine, the MARK III a vacuum tube machine and the MARK IV a solid state machine. These machines were externally programmed by a 24 hole paper tape, which was read in much the same way as a player piano reads its music roll. The roll advanced at a 200 step per minute rate. The MARK series did not survive since their internal designs did not allow adaptation to stored program methods.

THE DEVICES OF TODAY

The modern stored program digital machine came into being with Electronic Numerical Integrator and Computer - ENIAC. Dr. John Machly and Dr. J. Presper Eckert of the Moore School of Engineering of the University of Pennsylvania designed the system between 1942 and 1946. ENIAC had an add cycle time of 5000 operations/sec. This computer was a vacuum tube machine with electro-mechanical input and punched card output. Programming the system was still a tedious task, as it was accomplished by patching the electronic circuits together by patch cords, a task requiring many hours.

The first series of stored program computers was heralded by EDSAC in 1949 in England and EDVAC at Aberdeen Proving Grounds. These systems were soon followed by an impressive line of machines AVIDAC, ORACLE, ILLIAC, ORDVAC, MANIAC I and SILLIAC to mention but a few. Possibly the two greatest advances in technology contributing to computing machine advances were the discovery of semi-conductor devices, and magnetic cores. The first of these allowed substantial savings in space and power by eliminating vacuum tubes. Magnetic core technology allowed enhanced memory speed and size over the various acoustical delay line, magnetic drum and electrostatic memory systems previously utilized. This led to the National Bureau of Standards DYSEAC machine and MIT's real time SAGE system.

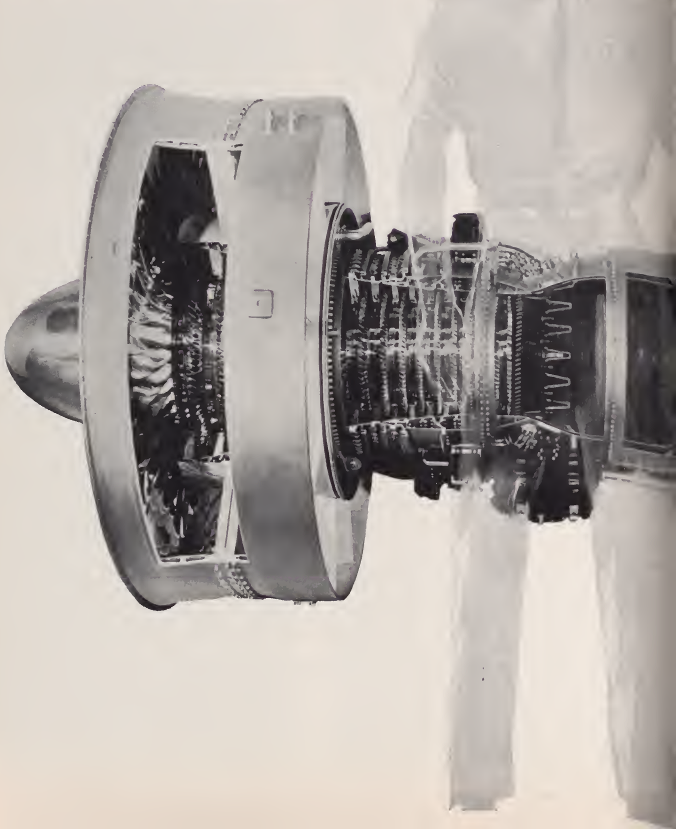
The second generation series of machines are all stored program machines with sophisticated software packages such as IBM's 7094, 7040, 7010 series and UNIVAC's 1100 series. Again in the 60's the advent of integrated circuits and large scale integration has enabled a third generation of machines to be designed, such as IBM's System-360 or SDS's SIGMA series. Sufficient knowledge is now available to allow hybrid analog-digital machines to be efficiently utilized for process control applications. This allows process sequencing and data processing to occur in the domain best suited for the particular application, and processing to be performed in the most efficient domain. The new hybrid machines have greatly improved the interface between the two domains.

Memory cycle times and arithmetic unit through-put efficiency have been enhanced to the point where one of the most serious problems in the computer industry today is input/output hardware. Many machines are severely hampered by slow input/output equipment. Several methods have been attempted to increase through-put efficiency in this area. Probably one of the best solutions at present lies in the direct coupled system, where two machines are wired core to core. The larger machine is then freed for computational work, and the smaller machine is used totally as an input/output executive for routing and queing in and out of the larger machine and the various hardware sources and sinks.

Another area that is just being developed is fluidics-hydraulic or pneumatic logic blocks. Now it is possible to build digital machines utilizing purely mechanical methods. Applications of this type of computing and control capability may free the interface problems in mechanical hardware used in many manufacturing processes.

Man dreams of building the "Giant Brain". Large computers give the impression that they can think, especially during the subtile electrical nervous breakdowns that they suffer. This, however, is a superb falsehood. A computer is an extremely fast idiot, that merely follows a set of programmed instructions. Its saving grace is that it can perform these operations at rapid rates. Even calling the machine an idiot is a misnomer as an idiot has some thinking capability, the computer does not. It cannot originate ideas and at best can be programmed to be adaptive, i.e., recognize patterns as like those previously introduced to it. A computer with the storage capacity equivalent to the human brain would require many warehouses to hold the equipment and the power of nearby Conawingo Dam to power it. The human mind's capacity in bits per access time in seconds varies from 10^{17} to 10^{23}. Even utilizing advanced thin film technology and optical techniques, machinery has been only able to reach such a ratio in capacity/access time in the order of 10^{13} bits/sec. Obviously even with the outstanding advances in computer technology to date great strides in technology must be realized before a hardware machine equivalent to the simplest biological computing system is realized.

Some say we specialize in power . . . power for propulsion . . . power for auxiliary systems . . . power for aircraft, missiles and space vehicles . . . *power* for *marine* and industrial applications . . .

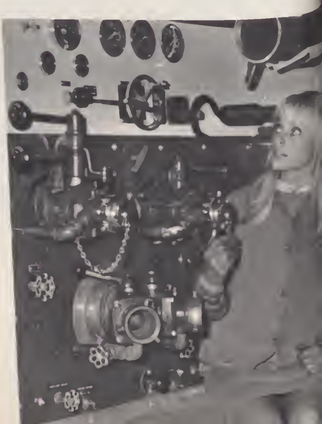


MECH MISS...

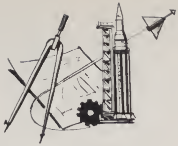
Karen Kroesen

This month's Mech Miss is Karen Kroesen, a twenty-year old Junior from Arlington, Va. Karen holds the titles of Delta Tau Delta Queen and 1967 G.W.U. Homecoming Queen. At G.W. Karen is on the Dean's List, a member of Tassels and has served on the Student Council's Freshman Orientation Committee and Publicity Committee.

Karen's other activities include the Messiah Chorus, Kappa Kappa Gamma Treasurer, and the G.W.U. Girls' Volleyball Team. It is interesting to note that a girl with all these qualities seems to prefer Electrical Engineers.



TECH NEWS



IC MASKS MADE AUTOMATICALLY

IBM has come out with a scheme to make masks for integrated circuits automatically. With this scheme, the number of hours can be reduced by as much as a hundred times. This process for the design and fabrication of masks consists of five basic steps. First the designer draws a rough pencil sketch of the circuit layout, then he translates this into digital form by describing the circuitry in a symbolic notation—a specially developed high-level language for the mask designer. In step 3, this symbolic language is fed to a computer and processed. In processing, the circuit structures are automatically assigned to their appropriate masks. The fourth step involves the actual drawing of the patterns computed by the computer on high-resolution photographic plates to 10 to 20 times the final size. In this step the plates are mounted on an x-y platform, which is driven by stepping motors. As the table is moved, under commands prepared by the computer, a light beam from a xenon flash lamp draws the mask pattern on the plate. The final step involves the exposed and developed plates being placed in a step-and-repeat camera to form a complete array of chip patterns at final size on photographic plates which, in turn, are used to expose the array of the chip patterns on the semiconductor wafer.

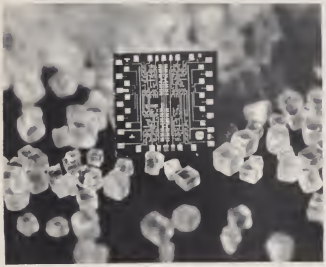


Fig. 1. Integrated circuit chip compared in size to crystals of table salt.

ENGINEERING LABORATORY EDUCATION EXAMINED

According to a report of the Commission on Engineering Education in the November issue of the Journal of ENGINEERING EDUCATION, college engineering laboratories are in serious trouble. The report found three specific problem areas which exist in laboratory programs: (1) the communication of ideas and methodology, (2) laboratory instruction aids, and (3) laboratory faculty. Suggestions for improving communication among faculty and institutions included summer workshops for faculty, a visiting laboratory faculty program, a visiting lecturer program of distinguished experimenters, publication of laboratory teaching "how-to-do" ideas in society journals or in the form of monographs, establishment of a national depository of laboratory information, equipping a bus or truck as a traveling laboratory, encouraging mutual laboratory improvement assistance programs between two or more universities, demonstrations of equipment at national meetings, and communication of the importance of laboratory instruction to the department heads at meetings of national societies. In the second problem area, the application of programmed learning was recommended to help the problem of the work load on the laboratory teacher. The prime consideration in laboratory effectiveness is the development of enthusiastic, capable faculty. The lab teacher could be stimulated by administrative encouragement, by promotional and professional recognition, and by freeing him of other responsibilities.

JUNE ENGINEERING GRADUATES

In a survey conducted by the Engineering Manpower Commission of Engineers Joint Council, it was found that 98% of the 22,000 new graduates covered by the survey had already accepted jobs or made other firm commitments by the time of graduation. Of the remaining 2%, practically all were still considering job offers. Of the new bachelor's degree recipients 65% either committed to or were considering job offers. With average starting salaries pushing beyond the $700 per month mark. Another 25% were going directly on to graduate school for an advanced degree with another 9% going into the armed forces. The other 1% had such things as the Peace Corps or Vista accounting for their plans.

Employment ranged from a high of 83% among petroleum engineers down to 30% for naval architects and marine engineers. Similarly, graduate study claimed 56% of the naval architects but only 10% of the petroleum graduates.

ELECTRIC EEL EXHIBIT

On September 29, 1967, Westinghouse Electric Corporation presented to the new Pittsburgh Aqua-Zoo an electric eel exhibit. An electric eel can generate up to 600 volts of

Edited by

James Wong

Fig. 2. Demonstration of electric eel's power.

electricity—enough to kill a man. The eel is a living battery—positive at the head and negative at the tail. When swimming, it gives off radar-like pulses of low-voltage electricity that serve as a kind of radar. When it detects food or an approaching enemy, it switches to full power and unleashes it death-dealing high voltage. In this exhibit there are electrodes at the ends of the tank to pick up the electricity and at feeding time, spectators can hear over a loudspeaker the pips caused by the radar signals, and when an eel attacks, spectators hear the startling "zap" and see the oscilloscope line jump. If the voltage is high enough—over 375 volts—it also causes a strobe lamp to give off a brilliant flash. An electric eel can strike several times before it has to rest for a few minutes to recharge.

FLUID POWER EDUCATION SYSTEM

The Scott-Engineering Sciences Corp. Fluid Power Education System (Pneumatic), Model 9088, provides students and instructors with the means to make over 80% of the popular control, sequence and automation circuits used in today's modern machines. The system uses compressed air as its fluid medium, meaning operation is clean and efficient. Electrically, it has a variety of switches and relays; electricity and air indicator lights; six pairs of power outlet jacks and a step-down transformer to reduce input voltage from 115 volts to a safe 24 volts a-c. The system's basic components include: a fitting for a plant air connection, air regulator and gage, air filter, air lubricator, filtered and regulated air supply manifold outlets and an air supply shut-off and system-discharge valve. The entire system is mounted "breadboard" fashion on a movable bench. This system also comes with an operation and experiment manual, plus a specially-keyed 3-volume fluid power text with associated slides.

EXPERIMENTAL LASER PUMP

An experimental laser pump using the principle of a ball of light, which "bathes" a laser rod from all directions, has been developed by the Westinghouse Research Laboratories. The laser pump supplies the light energy that stimulates a laser rod to emit its intense, coherent beam of light. The pump design puts the laser rod and lamp along the center of a hollow spherical reflector, the entire inside surface of which is reflecting. The design is an attempt to improve the efficiency of a laser system by coupling the pumping light more effectively to the laser rod. The spherical reflector focuses the pumping light in three dimensions, flooding the laser rod with light from all directions. This in turn allows for a more convenient arrangement of the lamp and rod, reducing interference with the pumping light.

Fig. 3. "Ball of light" laser.

FLAME-RESISTANT JACKET FOR JET FUEL LINES

A silicone rubber compound developed by General Electric has been selected for use as a flame-resistant protective jacket around fuel lines of a new jet engine. The material is designed to resist the flame and maintain the temperature of the fuel in the line at safe levels. The engine in which this has been selected for use is the CT64-820 which is to power the deHavilland "Buffalo" medium transport and is being manufactured at the GE Flight Propulsion Division plant.

JUNGLE CLUB

This club is composed mostly of Tarzans and Janes, however the membership is open to anyone who feels slightly savage or barbaric.

Sorry: We regret that because of the nature of this publication we were not able to furnish a picture of the activities of I-Felta-Thy—Every man's common fraternity.

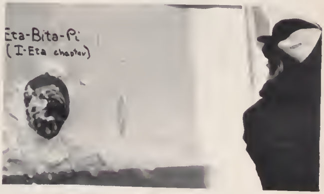
This month Super E presents outstanding Clubs from all over campus.

OLD EUROPE CLUB

This club gives the members an insight into the problems and hardships of bygone years. The members have learned to appreciate the easier but less exciting life of today.

ETA-BITA-PI

This club was designed for those with discriminating taste and aim. This club is truly in the best interest of the university in that they donate all their remnants to the Student Union to use as they see fit.



Don't tell, but we did catch an I-Felta-Thy man at work.

1967 FRANK HOWARD LECTURE

The George Washington University Engineer Alumni Association and the Engineers' Council sponsored the 1967 Frank Howard Lecture on November 15. This is a series endowed by a former trustee for lectures by scientific leaders on the general topic of the relationship of science to engineering and industry.

The 1967 Frank Howard Lecturer was Dr. William Shockley, Professor of Engineering Science at Stanford University. He is a Nobel Prize Winner in Physics (1956), inventor of the Junction Transistor, and consultant with Bell Telephone Laboratories.

Dr. William Shockley's topic was "City Slums and Research Taboos." He proposed that further studies be made on the social and urban problems, using scientific techniques. Dr. Shockley's studies seemed to indicate uncertainty in the environment vs. ethnic heredity question.

Since his views are somewhat controversial Mecheleciv has printed some opinions received by the students of SEAS.

ARE GENERIC DEFECTS HEREDITARY?

This is the basic question asked by Dr. William Shockley at the 1967 Frank Howard Lecture. Dr. Shockley is the noted scientist who shares the 1956 Nobel Prize in Physics for the discovery of the junction transistor.

Dr. Shockley claims to have discovered some frightening statistics indicating that the Negro community may not be evolving intellectually at the same rate as the white community. "My statistical studies suggest," he said, "a five I.Q.-point loss of ground for Negroes compared to whites between World War I and now. A five-point downward shift in median I.Q. in a population could be devastating if of genetic origin; it could cause a fourfold reduction in a supply-to-demand ratio for intelligent leadership." He also found that Jewish-Americans and Oriental-Americans are ten times more likely than the average citizen to win scientific eminence and avoid trouble whereas the Negroes do about ten times less well than the average.

Augmenting his concern is the fact that unskilled Negro parents average three times as many offspring as the higher achieving parents. If there is a genetic evolutionary process occurring then the results seem quite evident.

Dr. Shockley urges the intellectual community to join him in the quest for knowledge in this area. He demands that the religious and moral taboos be lifted so that research may be carried out in order to answer the question; Can selective multiplication of less effective members of society lead to genetic deterioration?

Thus, "Let's ask the questions, do the necessary research, get the facts, discuss them widely—then either the worries will evaporate or plans for action will develop."

—Peter M. Austin

ASPECTS OF HEREDITY

Negroes, the alleged second class citizens, are socially and economically disadvantaged. A gap exists between them and the Caucasians in this country. Attempting to close this gap are poverty programs, anti-discriminatory legislation, and the all encompassing civil rights movement. If these programs can provide a better life for the underprivileged, through an improved environment, will inequality among men be eradicated?

Possibly not says Doctor Shockley (Alexander M. Poniatoff, Professor of Engineering at Stanford University) speaking here at G.W. He produced sketchy evidence indicating that Negroes may have inferior mental capabilities than Caucasians. However, in an age where nearly everything is under investigation, this question has not been researched. Dr. Shockley wants the answer found, to allay fear or to realize a situation that would demand immediate attention.

On the assumption that Negroes are mentally inferior, the cause must be discerned, whether it is environment or heredity. If environment proves to be the only cause, our present policies may be properly attacking the problem. If heredity becomes involved as a probable cause, genetic studies must be undertaken.

Eugenics (the science which deals with influences that affect inborn or hereditary qualities of a race) could show a genetic degeneration as the cause. Eugenics has already shown that certain races show unmistakeable tendencies to inherit nervous disorders among many other manifestations in their offspring.

If a genetic offset is determined to exist, our present vast expenditures for these underprivileged may prove useless. The conclusion Dr. Shockley advanced was that quality population control may well be necessary to decrease the multiplication of the less effective members of society, to preserve the strength of the nation's people.

To resolve this, the greater problem of selective population control would be one of the great social achievements of the day. One that may never be needed, but nevertheless should be intelligently discussed to prepare for the need should it arise.

—George Steller

WHERE DOES IT END?

Dr. William Shockley is concerned with the "quality" of the human race.

—Continued on Page 22

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CAMPUS NEWS—Continued

Dr. Shockley is also a very tricky man. The first point of his lecture was devoted to reasons why man can have the right to decide who is unqualified and thus sterilize. He did this by showing: 1. approach the subject scientifically (cold objective reasoning), and 2. feel pity for those neurological systems that can have agonizing memory impressed onto them (warm human compassion).

Dr. Shockley may have a point when it comes to the very deformed, both mentally and/or physically. But he hints that the people of ghettoes and slums might also be eligible for sterilization. Where does it end?

By the divine power of scientific objectiveness and human compassion, you are now eligible to decide the fate of the unborn.

—Senior M.E. student,
Name withheld by request

A CALL FOR RESEARCH

Dr. Shockley presented material which was very thought provoking and stimulating. His presentation lacked continuity and his concern for the press and for being misquoted caused the lecture to be less interesting. Many engineers should follow Dr. William Shockley's lead and use our methods in areas as yet untouched by engineering.

—Senior E.E. student,
Name withheld by request

ENGINEERS' COUNCIL

The Engineers' Council voted unanimously to denote $200 worth of books to the Engineering Library. They will be chosen and placed in honor of the work of Dean Martin Mason. Dean Mason resigned as dean in order to return to full time teaching in the Engineering Mechanics Department of George Washington University.

The Constitution of the Engineers' Council has been revised in order to have the class representatives conform to the curriculum changes.

The second Freshman representative to the Engineer's Council is Donald Harmon. The Editors of Mechelecív sincerely regret the omission.

THETA TAU

On October 28, John Grier pledged the Gamma Beta Chapter of Theta Tau. Theta Tau plans to have its Annual Fall Banquet and Ball on December 2.

Congratulations to Theta Tau's Intramural Football team. It finished the season with a winning 4-1-1 record. Best of luck to its Intramural Basketball team.

ODDS AND ENDS

The U. S. Army Corps of Engineers has a Fellowship program with George Washington University on the masters and doctoral degree level. The student must have completed his graduate course requirements except for thesis. He will be employed in the Office of Chief of Engineers, Board of Engineers for Rivers and Harbors, and Corps of Engineers Division or District Office having civil works activities, the Coastal Engineering Research Center, or the Waterways Experiment Station. His employment period should supply work for his graduate degree thesis on a subject area pre-selected by mutual agreement between the student, the University, and the Corps of Engineers.

Travel provisions are included for travel to the University and research location.

Further details may be obtained in the Dean's Office.

* * * * * *

The Engineering Mechanics Department is sponsoring a seminar series that are held on Wednesday afternoon from 4:00-5:30 in Room 114 of Tompkins Hall.

Date	Speaker	Topic
October 4	Dr. J.H. Kelly, Postdoctoral Resident Research Associate, Naval Ship Research & Development Ctr.	"On Continuous Distributions of Dislocations"
October 25	Dr. A.V.M. Ferris-Prabhu, Assistant Prof., Engineering Mechanics Dept., GWU	"Laplace Transform Inversions Using Padé Approximants"
November 15	Dr. P. Van Dyke, Sr. Research Scientist Hydronautics, Inc. Laurel, Maryland	"Stress Concentration at Reinforced Circular Holes in Cylindrical Shells"
December 6	Dr. A.M. Kiper, Associate Professor, Engineering Mechanics Dept., GWU	"Bubble Growth in Film Boiling on a Horizontal Surface as a Variational Problem"
January 10	Mr. J. Geremia, Assistant Professor, U.S. Naval Academy Annapolis, Maryland	"Turbulence Simulation"

* * * * * * *

Dr. Nelson Grisamore has resigned as Chairman of the Electrical Engineering Department to return to teaching and research in the Electrical Engineering Department of George Washington University.

Dr. Louis dePain has been appointed Chairman of the Electrical Engineering Department.

THE SHAFT

Med. School: We have a case of Beri-beri over here. What'll we do with it?

Give it to the Engineers Council, they'll drink anything.

* * *

Mert: "Is it proper to hold an engineer's hand in the dark?"

Gert: "Yes, and usually necessary."

* * *

The apple of every man's eye is the peach with the best pear.

* * *

The meek little bank clerk had suspicions. One day he left work early and, sure enough, at home he found a strange hat and umbrella in the hallway and his wife was on the couch in the living room in the arms of another man. Wild for revenge, the husband picked up the man's umbrella and snapped it in two across his knee.

"There!" he exclaimed. "Now I hope it rains!"

* * *

While down South on a visit, the young Yankee made a date with a local lovely. When he called for her at home, she was clad in a low-cut, tight-fitting gown. He remarked, "That's certainly a beautiful dress."

"Sho 'nough?" she said sweetly.

"It sure does," he replied.

* * *

A college football coach was surprised to see a busty coed wearing a varsity sweater. Stopping the girl, he growled:

"What are you doing with a letter sweater? Don't you know you're not supposed to wear one unless you've made the team?"

The coed smiled, then cooed, "Well?"

* * *

"I shall now illustrate what I have on my mind," said the E. E. Prof. as he erased the board.

C. E.: "What would you say if I stole a kiss?"

She: "What would you say to a guy who had a chance to steal an automobile but only took the windshield wiper?"

* * *

All girls are born good. Experience makes them better.

* * *

The old-fashioned girl used to tuck money inside her bodice. The modern girl prefers to keep it where it won't be seen.

* * *

Little Jack Horner
Sat in the corner,
Crib notes under his eye.
He opened his book
And took a quick look,
And now he's Tau Beta Pi.

* * *

Moral: Chaste makes waste.

* * *

Then there was the coed who thought indifferent meant doing it a new way.

* * *

There was also the girl who got her pilot's license and asked fellas if they wanted to go up.

* * *

The groom awoke the morning after his wedding to find his bride in tears. "Why are you crying?" he asked.

"Look," she sobbed, pointing to him. "We almost used it all up the first night."

* * *

First Chemist rejoicing after months of intensive research, "I have just discovered a new method of making a hormone."

Second Chemist: Amazing, how do you do it?"

First: "Don't pay her."

* * *

Grandma (looking at granddaughter's new bikini): "If I could have dressed like that when I was a girl you would be six years older today."

* * *

There are three classes of G. W. U. coeds; the intellectual, the beautiful, and the majority.

* * *

Looking coldly at the E. E. who had just given him a nickel for carrying his bag twelve blocks, the little boy said, "You know mister, I know something about you."

"What?" asked the E. E.

"You're a bachelor."

"That's right. Do you know anything else about me?"

"So was your father."

* * *

Lectures are like steer horns — a point here, a point there, and a lot of bull in between.

* * *

Famous last Word: "Hell, he won't ask us that."

* * *

Famous last Word: "Don't worry, he can't flunk us all."

* * *

At a small hotel in Miami Beach a young lady was on the roof taking a sun bath clad only in a bikini. In looking around, she discovered that there were no tall buildings near by so she decided to take a real sun bath. Taking off her bikini and lying on her stomach, she was enjoying herself when she heard footsteps approaching. She quickly grabbed a towel around her and looked up to see the manager approaching.

"Young lady, we don't mind your sun bathing, but we won't allow nude sun bathing."

She flushed and angrily replied, "But there aren't any tall buildings close enough to see me."

"I know," he replied, "but you're lying on the skylight over the dining room."

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